REVIEW ARTICLE

HARNESSING INDIGENOUS KNOWLEDGE: A REVIEW OF JEEVAMRUT'S ROLE IN SOIL HEALTH AND CROP PERFORMANCE

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Abstract:

This review article synthesizes extensive research on Jeevamrut. It is an indigenous organic biofertilizer formulated from farm inputs like cow dung, cow urine, jaggery, pulse flour and soil. The review explorer's composition, various preparation methods along with its impact on soil health, performance and economic viability for farmers. The application of Jeevamrut consistently demonstrate positive effects on various crops like millets, sugarcane, etc. Basically, Jeevamrut is and microbial formation that mobilizes the nutrients from soil. Economically Jeevamrut based system reduces Reliance on synthetic fertilizer. As Jeevamrut offers effective alternative to chemical inputs in farming along with offering alternative that saves cost improves profitability for cultivators but adaptation of Jeevamrut faces challenges related to standardization, shelf life, market infrastructure. This review highlights the critical need for continued long term field trials, refined applications protocol and other framework to fully realise potential as an eco-friendly alternative to chemical fertilizers. paving the way for a more resident and environmentally responsible agriculture future.

Keywords: Waste, Fermentation, Biofertilizer, Sustainable Agriculture.

Introduction:

The green revolution tried to fulfil the world's need of food. It pushed food production globally. In the green revolution, use of synthetic fertilizers and pesticides are often used widely. It led to higher yield but also caused serious ecological problems like soil degradation, loss of biodiversity, water pollution etc. (Vibha *et al.,* 2023). But the farmers use the chemically synthesised fertilizers in unsystematic way. It results in decrease in soil health, reduced fertility and affected on long term agriculture productivity (Somdutt *et al.,* 2023). So to overcome these problems, we will look towards sustainable agriculture practices including organic and natural farming. Basically, the natural farming

is based on traditional Indian agriculture knowledge system which exclude the use of synthetic fertilizer. This approach includes the integration of livestock, especially the local breed cows. The core objective of this farming is to improve soil health, ecosystem balance, restoration, and the ultimate aim is to reduce production cost. The central tent of natural farming is the use of on farmer's inputs such as Bijamruth, Ghanjumruth and significantly Jeevamrut. It also focuses on the maintaining optimum soil aeration that is Wapsa.

The alternative names for Jeevamrut are jeevamrutha, jeevamrutham. Jeevamrut is the fermented microbial formulation prepared from easily available natural ingredients. The production of Jeevamrut primarily use the waste of cow like cow dung and cow urine. (Reddy *et al.,* 2021). The Jeevamrut has wide applications in the field of natural farming as the chemically synthesized fertilizer directly supplies nutrients but the jeevamrut primary role is acts as bio stimulant or bio-enhancer. It is rich in beneficial microbes that improves various processes in soil along with nutrient cycling (Aulakh *et al.,* 2013). The negative impact of the chemicals motivates to shift towards the safer way to production of crops by using inputs like Jeevamrut. This is an effective alternative to use of synthetic chemical-based farming. The use of Jeevamrut in farming is an efficient way to overcome all the negative impacts of chemical and obtaining a residue free food. Jeevamrut as a symbol of agriculture autonomy, decreasing dependence on external corporate controlled supply chains. It reduces reliance on external chemical inputs which lowering the cultivation cost which is most prominent problem faced in the modern agriculture practices in which higher cost, costly chemical fertilizers can increase the cultivation cost. As considering the popularity and the traditional use of Jeevamrut and to review the existing research on the Jeevamrut repressions and its actual impact on the crop. It is essential to overlook all the aspects regarding Jeevamrut.

This review Highlights the knowledge gap by providing a detailed analysis of current scientific understandings with the following objective.

1. To analyse all the data on the various composition of Jeevamrut that reported in scientific literature.
2. Extensively analyse all the impact of Jeevamrut on the soil, including microbial analysis.
3. To do evaluative study of influence of jeevamrut on the crop growth or overall production quality.
4. To identify existing challenges along with the research gap and future directions

Jeevamrut: Composition and Preparation Methods

Jeevamrut is a liquid fermented manure. It is basically a fermented culture from specific combination of Natural along with on-farm ingredients. It has bio-enhancer action this is due to the action of all these ingredients in fermented product.

1. Core ingredient:

The Jeevamrut is typically produced by using cow dung, cow urine, Jaggery, pulse flour and soil (Aulakh *et al.,* 2013, Madrewar *et al.,* 2025). The water is the solvent in which All these ingredients are mixed.

- **Cow dung: -**It is the primary source of beneficial microbes includes Nitrogen, PSB. It contributes as a source of organic matter as a substrate for micro-organisms.

- **Cow urine: -** Serves as source of essential micronutrients including nitrogen & potassium. It contains uric Acid which arts as N source for microbial proliferation along with plant uptake.
- **Jaggery: -** Acts as carbon source, it also supports the rapid proliferation and enhancing the metabolic activities of microbial population during the fermentation.
- **Pulse Flour:** It acts as protein and amino acid source along with this also support the proliferation of microbial population.
- **Soil:** A small handful of soil is mixed in the mixture. Soil acts as the inoculum of beneficial microbes. It ensures the presence of microbial strains on the field where the jeevamrut have to apply.
- **Water:** water is the solvent for dissolving all the ingredients. generally, 20-200 litre of water is taken for one batch of jeevamrut.

2. Preparation Process:

The preparation of jeevamrut follows a relatively simple yet precise methodology to ensure optimal fermentation and microbial growth.

The Palekar (2006) give formulation of production of jeevamrut is as follows:

- Fresh Cow Dung - 10-12 Kg
- Cow urine - 10-12 Litre
- Jaggery - 2 Kg
- Pulse Flour - 2 Kg
- Water - 200 litre
- Soil - Approx. 100 gm.

This mixture is stirred and allowed for fermentation and every day it is stirred 2-3 times (Aulakh *et al.,* 2013). This fermentation is carried out in large containers like 200 litres drum. the fermentation period varies accordingly to external temperature. In summer season the period is about 3-4 days. In winter 6-7 days for fermentation. For maintenance of constant temperature, the fertilization container kept in the shade or out of direct sunlight.

3. Microbial Dynamics during Fermentation:

The jeevamrut acts as bio-stimulant, it acts as source of beneficial microbes to improve soil health and improve yield. In jeevamrut fermentation large number of microbial populations are actively proliferating. The total microbial count including Bacterial and fungal count shows significantly increase in numbers that of initial number (Mevada *et al.,* 2023). Some studies have reported 5-7 times increase in nitrogen fixing bacteria and Phosphate solubilizing bacteria as compared to their original count in the cow waste. This clear that jeevamrut provide enrichment environment for microbial proliferation. Some microbes show dominance i.e., widely present in the jeevamrut including bacterial phyla such as *Proteobacteria* and genera including *Bacillus, Pseudomonas, Rhizobium, Panibacillus.* Along with this fungal phyla *Ascomycota (*Saharan *et al.,* 2023).

4. Shelf Life:

Basically, the jeevamrut is fermented manure containing beneficial micro flora that improves soil health and increases yield. The practical use of jeevamrut is influenced by its shelf life and storage

requirements as it contains microbes which follows the growth curve including phases like lag, log, stationery and death. The optimum activity shown in 10 to 12 days of fermentation. Some sources suggest it can be stored for 62 to 75 days if it kept in shade and stirred.

5. Impact on Soil Health:

Jeevamrut contributes primarily in sustainable agriculture lies in its profound and multifunctional impact on soil health. Acts as powerful bio-inoculant. It regulates the soil ecosystem by enhancing microbial activity, along with improving in the physiochemical properties and stimulating enzymatic process. The jeevamrut introduces and stimulates diverse array of beneficial microbes in the soil, acting as a potent microbial inoculum, these include crucial nitrogen fixer bacteria such as *Azotobacter* and *Rhizobium* as well as potassium solubilizing bacteria like *Pseudomonas. The* jeevamrut also promotes the growth of *Actinomycetes* and decomposer fungi including *Aspergilus* and *Trichoderma* (Somdutt *et al.,* 2023).

Material and Methods:

Basically, jeevamrut is prepared by on farm inputs like farm waste. The jeevamrut was prepared according to standard protocols. The palekar suggested recipe which includes 10 to 12 litres of cow urine ,2 kg of jaggery, 10 to 12 kg of cow dung, 2 kg of false flour in 200 litre waters with approximate 100 gram of soil. (Saharan *et al.,* 2023).

To investigate the performance of the jeevamrut various field trials along with lab studies have been carried out using various experimental designs. Field experiments, where typically arranged in Randomized Complete Block (RCBD) or Completely Randomized Designs (CRD) with multiple replications (Saharan *et al.,* 2023). The trials include common test crop, included cereals (wheat, millet such as finger millet, kodo millet, little millet, etc), sugarcane. Soil and plant measurement were made to assess the treatment effect. Soil samples were collected from multiple points in the farms before treatment and after treatment to analyse physiochemical properties. The Kjeidhal method for nitrogen(N), Olsen/P- bray for Phosphorous (P), Flam photometry for potassium(K), Wakley-Black or Titration for total organic carbon, pH and Conductivity, etc. these methods were used to evaluate the physiochemical properties of soil.

As the jeevamrut is the beneficial for supplying the beneficial micro flora for supporting the growth of plant. In previous studies, the estimation of the number of various microbes have been studied. The estimation is carried out by serial dilution and plating on the selective media Nutrient media for Total Bacterial Count, Martin's Rose Bengal Agar for fungi, specific media for Actinomycetes. CFU (Colony Forming Unit) where counted after incubation at 28-30°c). By using this, the isolation of the microbes takes place from the jeevamrut and soil. The morphological characterization that is colony shape, colony size, colour, Gram Staining and motility taste was performed by chemical taste like catalytic taste, Indole taste, MR-VP taste, citrate utilization taste, urease taste, starch hydrolysis taste etc. performed on represent respective culture to identify permanent to functional traits (Vibha *et al.,* 2023) different farm waste gives different biological load that is use of waste of different breeds of cows give different number of microbial population.

Results and Discussion:

Application of Jeevamrut is widely recognised Cost-effective, Eco-friendly way to improves soil health, also boost the microbial activity. By this ultimately increase the crop yield. When the Jeevamrut is used Four times in Cereals and Eight times in Vegetables will improves the productivity (Harish *et al.,* 2024). The Jeevamrut is also beneficial in Wheat Crop. When the Jeevamrut is used in higher concentration (e.g., 8% - 10%) then it will give higher grain and Straw yield (Kumavat *et al.,* 2021). When the Biofertilizer like Azotobacter, VAM and PSB are used in the conjugation with Jeevamrut it boosts the beneficial microbes that supports the plant growth (e.g., Bacteria, Fungi, Actinomycetes) Along with this it also enhances the nutrient cycling and Disease resistance (Patel *et al.,* 2023).

Across all the experiments the jeevamrut shows positive impact on the crop yield as compared to controls in cereals and millets plants in jeevamrut plot shows taller structure and heavier grains. The jeevamrut is also beneficial in case of root crops like Carrot. The application of jeevamrut on Carrot result in increases biomass and increase in beta carotene content (Vala *et al.,* 2024). The application of jeevamrut also positively impacts on soil properties and microbial population of soil which is expressed in Table 1, It shows increase in organic carbon, Available nitrogen(N), Available Phosphorus(P), Available Potassium(K), Increased Availability of micronutrients like Zinc (Zn), Iron (Fe), Copper (Cu), Manganese (Mn).

Table 1: Effect of Jeevamrut on Different Physicochemical Properties of Soil

Soil Property	Reported impact by Jeevamrut	Quantitative Data	Reference
Organic Carbon	Significant Increase	Up to 40% Increase	Somdutt *et al.,* 2023
Available Nitrogen (N)	Enhanced Availability through Mineralization and Nitrogen fixation.	Increased available nitrogen. e.g., 288.1 Kg ha^{-1}	Aulakh *et al.,* 2013
Available Phosphorus (P)	Improved Availability Including Solubilisation of Fixed Phosphorus(P)	Up to 43.9% Increased	Madrewar *et al.,* 2025
Available Potassium (K)	Improved Availability	Up to 142% Increased	Saharan *et al.,* 2023
Zinc (Z)	Increased Availability of micronutrients.	Up to 98% Increased	Lakhani *et al.,* 2024.
Iron (Fe)	Increased Availability of micronutrients.	Up to 23% Increased	Aulakh *et al.,* 2013
Copper (Cu)	Increased Availability of micronutrients.	Up to 62% Increased	Lakhani *et al.,* 2024
Manganese (Mn)	Increased Availability of micronutrients.	Up to 55% Increased	Lakhani *et al.,* 2024

The Jeevamrut improves the crop yield. Previous study highlights that the positive effect on growth is directly related to the overall crop yield. Jeevamrut application has been shown to increase the pods in plants, Increase Pod weight, number of spikelets per year. The Table 2 shows the impact of Jeevamrut on various crops, Jeevamrut is effective in case of Wheat, Pomegranate, Groundnut, Ashwagandha, Soybean, Little Millet, Pearl Millet, Sugarcane.

Table 2: Effect of Jeevamrut on Various Crops.

Plant	Impact of Jeevamrut	Reference
Wheat	10% Jeevamrut resulted in wheat Grain yield of 41.19 q/ha. Which is 13.13 % higher than the control.	Bhadu *et al.,* 2021
Pomegranate and groundnut	Jeevamrut used for management of leaf spot diseases	Upperi *et al*., 2008
Ashwagandha	High Yield	Deshmukh *et al.,* 2010
Soybean and wheat	Higher seed yield	Shwetha, 2008
Little Millet	Higher Grain Yield	Vaghasiya *et.al.,* 2024
Pearl Millet	Increase in grain yield and straw yield	Singh *et al.,* 2024
Sugarcane	Increased Chlorophyll intensity, Cane thickness	Chovatiya *et.al.,* 2024

Limitations and Challenges

Nothing is perfect in the world Jeevamrut also signifying that it also has some limitations and challenges are being faces it to commercialise it, these limitations and challenges are as follows

- **Yield variability and initial reduction:** Jeevamrut generally announces the yield but some studies also make a glance on the initial reduction of the yield during the transition period from conventional to natural farming. Studies shows that when the Jeevamrut is applied in the field of rice- wheat and Maize -wheat systems showed 16%-58% lower grain yield when it is applied alone.
- **Nutrient deficiency:** Basically, Jeevamrut is a microbial consortium that have beneficial micro-organisms that helps to plant by converting the complex nutrient into plant consumable form that is the application of may not always meet the full nutrient requirements of highly demanding crops.
- **Input quality variability:** The Jeevamrut is produced from farm waste like cow dung, etc. Hence there is inconsistencies in the quality of raw material the quality of Jeevamrut also affected by variations in the preparation methods.
- **Self-life:** The Jeevamrut is a microbial formation. So, it is having relatively short effective self-life about 10 to 12 days. This will possess logistic challenges for large scale applications along with commercialisation and storage.

Research gap and future directions

As all problems have solutions so to overcome the existing limitation cell fully unlock the potential of Jeevamrut several areas should require research.

- **5.2.1 Standardization of protocol:** Every standardised a process can you fire and efficient result the research is needed to standardize the Jeevamrut production and application protocol, It include the research to optimise the ingredients are shows optimal Fermentation condition and application rate rates for different soil types and crops. The research in these areas will ensures the consistency in the quality and maximize benefit.
- **5.2.2 Long term field trials:** There is a critical need for more expensive and long-term field price across diverse agro ecological zones to do assessment of Jeevamrut's suitability along with its effectiveness on soil has its long-term effect on crop productivity the research on the field trials explores optimal composition and interactions with other natural inputs.
- **5.2.3 Integrated approaches:** The research in the area of integrated integration of Jeevamrut with other organic inputs like Panchagavya, vermicompost, green manure and other bio-fertilizers, etc. This could help to reduce nutrient deficiency is in the exhaustive cropping system and optimise or all nutrient management.
- **5.2.4 Nano Jeevamrut:** The Nano-technology is booming in the 21st century. The Jeevamrut preparation can helps to commercialize the Jeevamrut and also make positive impact on agriculture economy and the large-scale production can be achieved.

Conclusion:

Jeevamrut act as pivotal components of natural farming it offers a best alternative to environmentally taxing particles of conventional agriculture. All the collective evidences from field trials along with laboratory analysis confirms that Jeevamrut benefits the crop yield along with soil health in organic system. Jeevamrut rich in micro flora that mobilise soil nutrient and increases the yield. It may acts as stepping stone towards residue free food for future generation. The microorganisms present in the Jeevamrut mobilises nutrients in the soil and make available for plant utilisation. Results in higher yield for example in case of cross like millets, carrot and sugarcane. This comprehensive review underscores its huge capacity to regulates soil health by significantly enhancing microbial population and along with improving crucial physicochemical properties of soil. It also improves self-sufficient ecosystem moving the agriculture paradigm from **"**Feeding the plant" to "Feeding the soil". Economically Jeevamrut presents a highly attractive propositions for farmer offering reduction in crop cultivation cost. This review highlights the potential of Jeevamrut in greater agriculture economy and resilience. Jeevamrut is holistic approach to sustainable agriculture integrating traditional wisdom with modern scientific understanding overall by adopting Jeevamrut in the farming aligns with the goal of sustainable climate smart agriculture help in small farmers Achieve productivity gains while restoring ecosystem.

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